

REMARKS

By the present amendment and response, claims 11, 20, and 25 have been amended to overcome the Examiner's objections. Claims 11, 14-16, and 18-29 are pending in the present application. Reconsideration and allowance of pending claims 11, 14-16, and 18-29 in view of the above claim amendments and the following remarks are requested.

The Examiner has rejected claims 20-23 and 25-28 under 35 USC §102(e) as being anticipated by U.S. patent number 6,014,318 to Shinji Takeda ("Takeda"). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by amended independent claims 20 and 25, is patentably distinguishable over Takeda. However, Applicant reserves the right to provide declarations and/or documents under 37 CFR 1.131 to "swear behind" the effective filing date of Takeda.

Subject to Applicant's reserved right to establish priority of the present invention under 37 CFR 1.131, Applicant submits that the present invention, as defined by amended independent claims 20 and 25, teaches, among other things, "a through hole traversing said first and second layers of metal of said printed circuit board," "said through hole being completely filled with a second portion of said mold compound," "wherein said second portion of said mold compound in said through hole locks said first portion of said mold compound into said printed circuit board." As disclosed in the present application, during a molding process, mold compound surrounds and covers the die attached to the top surface on the printed circuit board. During the molding process, the mold compound is forced into the through hole such that the through hole is completely filled with a

portion of the mold compound. As disclosed in the present application, the portion of mold compound that is situated in the through hole achieves a strong chemical and mechanical bond with the walls of the through hole. As a result, the strong chemical and mechanical bond formed between the walls of the through hole and the portion of mold compound situated in the through hole effectively “stakes down” the portion of mold compound surrounding the die to the second layer of metal on the top surface of the printed circuit board.

Thus, as disclosed in the present application, the portion of mold compound in the through hole acts as a plug and locks the mold compound into the printed circuit board. Thus, by filling the through hole with a portion of mold compound, the present invention significantly increases the mechanical and chemical adhesion between the mold compound and the printed circuit board and, therefore, substantially increases the reliability of the plastic laminate-based molded IC package.

In contrast to the present invention as defined by amended independent claims 20 and 25, Takeda does not teach, disclose, or suggest “a through hole traversing said first and second layers of metal of said printed circuit board,” “said through hole being completely filled with a second portion of said mold compound,” “wherein said second portion of said mold compound in said through hole locks said first portion of said mold compound into said printer circuit board.” Takeda specifically discloses vapor holes 7, which are exposed vertically from the boundary face of sealing resin at wiring substrate 1 and which provide exhaling routes of expanded water vapor formed in wiring substrate 1.

See, for example, column 6, lines 4-11 and Figure 9 of Takeda. In Takeda, vapor holes 7 are formed in wiring substrate 1 and filled with epoxy resin or solder resist material prior to molding of a BGA package with sealing resin. See, for example, column 5, lines 33-49 and Figure 10 of Takeda. Thus, since vapor holes 7 are filled with epoxy resin or solder resist material prior to sealing the BGA package with sealing resin (i.e. mold compound) in a molding process, vapor holes 7 cannot contain a portion of the same sealing resin that is utilized to mold the BGA package. Thus, in contrast to the present invention as defined by amended independent claims 20 and 21, vapor holes 7 do not contain a portion of the sealing resin. As a result, there is no portion of sealing resin in vapor holes 7 that can lock the portion of sealing resin situated over semiconductor chip 2 into wiring substrate 1.

Additionally, in Takeda, vapor holes 7 are utilized to provide exhaling routes for expanded water vapor in wiring substrate 1. Thus, since expanded water vapor in wiring substrate 1 must be allowed to pass through vapor holes 7, vapor holes 7 cannot be filled with a portion of mold compound. As such, Takeda teaches away from forming a portion of mold compound in vapor holes 7 and utilizing the portion of mold compound in vapor holes 7 to act as a plug to lock down the mold compound to wiring substrate 1. For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by amended independent claims 20 and 25, is not suggested, disclosed, or taught by Takeda. As such, the present invention, as defined by amended independent claims 20 and 25, is patentably distinguishable over Takeda. Thus claims 21-23 depending from amended

independent claim 20 and claims 26-28 depending from amended independent claim 25 are, *a fortiori*, also patentably distinguishable over Takeda for at least the reasons presented above and also for additional limitations contained in each dependent claim.

The Examiner has rejected claims 11, 14-16, and 18 under 35 USC §102(e) as being anticipated by U.S. patent number 6,107,679 to Takashi Noguichi (“Noguichi”). For the reasons discussed below, Applicant respectfully submits that the present invention, as defined by amended independent claim 11, is patentably distinguishable over Noguichi. However, Applicant reserves the right to provide declarations and/or documents under 37 CFR 1.131 to “swear behind” the effective filing date of Noguichi.

Subject to Applicant’s reserved right to establish priority of the present invention under 37 CFR 1.131, Applicant submits that the present invention, as defined by amended independent claim 11, includes, among other things, “a blind hole extending through said second layer of metal of said printed circuit board,” where the blind hole is filled with mold compound. The present invention, as defined by amended independent claim 11, achieves similar advantages as the present invention as defined by independent claims 20 and 25 discussed above.

In contrast to the present invention as defined by amended independent claim 11, Noguichi does not teach, disclose, or suggest “a blind hole extending through said second layer of metal of said printed circuit board,” where the blind hole is filled with mold compound. Noguichi specifically discloses counter sinks 18, which are formed at the bare ends of base material 1, and conductive patterns 3, which are formed on the surface of

base material 1. See, for example, column 2, lines 5-9 and column 4, lines 3-8 and Figure 5(b) of Noguchi. However, in Noguchi, counter sinks 18 do not extend through conductive patterns 3 to base material 1. Furthermore, Noguchi fails to teach, disclose, or suggest forming counter sinks 18 such that they (i.e. counter sinks 18) extend through conductive patterns 3.

For the foregoing reasons, Applicant respectfully submits that the present invention, as defined by amended independent claim 11, is not suggested, disclosed, or taught by Noguchi. As such, the present invention, as defined by amended independent claim 11, is patentably distinguishable over Noguchi. Thus claims 14-16 and 18 depending from amended independent claim 11 are, *a fortiori*, also patentably distinguishable over Noguchi for at least the reasons presented above and also for additional limitations contained in each dependent claim.

The Examiner has further rejected claim 19 under 35 USC §103(a) as being unpatentable over Noguchi in view of U.S. patent number 5,825,628 to Garbelli et al (“Garbelli”). As discussed above, amended independent claim 11 is patentably distinguishable over Noguchi. Thus claim 19 depending from amended independent claim 11 is, *a fortiori*, also patentably distinguishable over Noguchi for at least the reasons presented above and also for additional limitations contained in each dependent claim.

The Examiner has further rejected claims 24 and 29 under 35 USC §103(a) as being unpatentable over Takeda in view Garbelli. As discussed above, amended

independent claims 20 and 25 are patentably distinguishable over Takeda. Thus claim 24 depending from amended independent claim 20 and claim 29 depending from amended independent claim 25 are, *a fortiori*, also patentably distinguishable over Takeda for at least the reasons presented above and also for additional limitations contained in each dependent claim.

Based on the foregoing reasons, the present invention, as defined by independent claims 11, 20, and 25 and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 11, 14-16, and 18-29 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance for all claims 11, 14-16, and 18-29 pending in the present application is respectfully requested.

Respectfully Submitted,
FARJAMI & FARJAMI LLP

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